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Lichenological notes 1: *Acarosporaceae*

Kerry Knudsen[1] & Jana Kocourková[2]

kk999@msn.com & kocourkovaj@fzp.czu.cz

[1]*Herbarium, Department of Botany and Plant Sciences, University of California Riverside CA, 9252–0124, USA*

[2]*Department of Ecology, Faculty of Environmental Sciences Czech University of Life Sciences Prague Kamýcká 129, Praha 6 - Suchdol, CZ–165 21, Czech Republic*

Abstract — A neotype is designated for *Acarospora interjecta*. *Acarospora pyrenopsoides* is not recognized as occurring in Canada. *Sarcogyne crustacea* is a new name for *Biatorella terrena,* a rare terricolous species from southern California, which is revised.

Key words — biological soil crusts, lichenicolous lichens

1. *Acarospora interjecta* H. Magn., Meddel. Göteborgs Bot. Trädgard 5: 69 (1930).

Type: **U.S.A. new mexico:** las vegas, 1927, *Bro. G. Arséne 19749* (FH, neotype **designated here**).

Acarospora interjecta is a lichenicolous lichen parasitic on the yellow effigurate *Acarospora novomexicana* H. Magn. It was described from a single specimen in the herbarium of Bouly de Lesdain collected by Brother G. Arséne in New Mexico (Magnusson 1930). The holotype is believed to have been lost in the bombing of Dunkirk during WW2 when B. de Lesdain's herbarium was destroyed. No isotypes were cited in the original publication. At Farlow Herbarium (FH), the first author examined specimens of *A. novomexicana* collected in Las Vegas, New Mexico, by Brother G. Arséne, searching for other possible specimens of *A. interjecta*. Only one specimen of *A. interjecta* was found, but with several apothecia, growing on a paratype of *Acarospora novomexicana* on sandstone. It perfectly matches the protologue (Magnusson 1930) which, based on a scanty type, describes a brown species with rather thick paraphyses (2–3 µm), broadly globose to ellipsoid ascospores (3–4 × 2–2.5 µm) and asci (70–80 × 20 µm) with about 100 ascospores per ascus. The hymenium ranged from 100–170 µm in height. We further observed that the ascospores begin globose but in

maturity become broadly ellipsoid [a development seen in some species like *A. strigata* (Nyl.) Jatta] and have a distinct perispore. We designate this specimen as a neotype.

Three other parasitic species of *Acarosporaceae* known from North America have ascospores with distinct perispores: two lichenicolous lichens [*Acarospora stapfiana* (Müll. Arg.) Hue on *Caloplaca* species and *A. succedens* H. Magn. on *Dimelaena oreina* (Ach.) Norman (Knudsen 2008a)] and one lichenicolous fungus [*Sarcogyne sphaerospora* J. Steiner on *Candelariella* species (Lendemer et al. 2009)]. Magnusson compared *A. interjecta* to *A. anatolica* H. Magn., a parasitic species known only from the holotype collected in Turkey on *D. oreina* (Magnusson 1930). *Acarospora anatolica* differs mainly from *A. interjecta* in having thinner paraphyses (1–1.5 µm) and in developing a thick elongated mycelial base (gomphate). The type of *A. anatolica* (BP) is scant and we hope to eventually evaluate new collections from Turkey.

2. *Acarospora pyrenopsoides* H. Magn., Meddel. Göteborgs Bot. Trädgard 2: 74 (1926).

Type: **GREENLAND.** nennese, *J. Vahl* (UPS, holotype).

Acarospora pyrenopsoides was described from a collection by J. Vahl from Nennese on the east coast of Greenland (Magnusson 1926). It is a brown *Acarospora*, lacking secondary metabolites, forming a contiguous thallus several centimeters wide. For a description see Magnusson (1929: 156–157, not on page 356 as listed in the monograph index!). Magnusson considered it a distant relative of *A. nitrophila* H. Magn. and reported other specimens from Austria, Denmark, and Finland (Magnusson 1929). *Acarospora pyrenopsoides* was reported from Ellesmere Island in the Nunavut Territory of Canada (Thomson & Scotter 1985). The species is included on the checklist of the lichen-forming, lichenicolous, and allied fungi of the continental United States and Canada based on that report (Esslinger 2009). The collection was made by George W. Scotter and determined by John W. Thomson, who put a question mark by his determination. The first author recently compared the Scotter collection with the holotype from Greenland and they are not conspecific, differing distinctly in thallus types. Scotter's specimen has dispersed verruca while *A. pyrenopsoides* has a contiguous areolate thallus that is much darker in color too. Unfortunately, the small Scotter collection was not any species with which we are familiar and should be re-examined in the future after the *Acarosporaceae* for Fennoscandia are revised by Martin Westberg for the Nordic Lichen Flora series.

Specimen Examined. – **CANADA. Northwest Territories**: Ellesmere Island, 79° 59' N 85° 50' 46" W, 11.iv.2009, *Scotter* (WIS).

3. *Sarcogyne crustacea* K. Knudsen & Kocourk., **nom. nov.**

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= *Biatorella terrena* Hasse, The Bryologist 14 (1): 3 (1911),
non *Sarcogyne terrena* H. Magn. 1935.

Type: **U.S.A. california: Los Angeles Co.,** San Gabriel Mountains, north fork of San Gabriel Canyon, Squirrel Inn, 1300 m, on earth between stones and base of rocks, vii.1901 *H.E. Hasse* (FH, **holotype**).

Biatorella terrena was described in The Bryologist (Hasse 1911) but not included in the flora of southern California (Hasse 1913) or the recent treatment of *Sarcogyne* for the Sonoran desert region (Knudsen & Standley 2008). It was only known from the holotype collected by Hasse. Neither Magnusson (1935) nor Knudsen & Standley (2008) saw the type until the first author of this paper discovered the holotype of *B. terrena* during a visit to the Farlow Herbarium (FH) in 2009. Hasse, who had not re-labeled the holotype before his death in 1915, wrote only the working name "*Biatorella fuscata.* Type" on the packet. We were in the process of describing a conspecific *Sarcogyne* but were hesitating because we had not been able to collect more substantial specimens for a type and for photography. We were happy that Hasse had already described the species.

Only one other species of terricolous *Sarcogyne* has been described, *Biatorella terrena* H. Magn. from Brazil (Magnusson 1927). Magnusson's name was illegitimate (a later homonym of *B. terrena* Hasse), which he rectified when he revised his species as *Sarcogyne terrena* H. Magn. (Magnusson 1935). Hasse's species now fits in the modern concept of *Sarcogyne* Flot. (Knudsen & Standley 2008). Because Magnusson had already used the specific epithet *terrena* in the genus *Sarcogyne,* we here propose a new name for Hasse's species, *S. crustacea*. *Sarcogyne terrena* needs a modern revision, but differs from *S. crustacea* especially in the lack of a corticated thallus, much smaller apothecia (0.2–0.3 mm in diam.) without a distinctly crenulate margin, the lack of an algal layer beneath the apothecium, and no observed pycnidia (Magnusson 1935).

The thallus of *Sarcogyne crustacea* is continuous, to 10 cm across, forming "pseudo-areoles" caused by splitting and drying of the soil separating the thallus into sections. The thallus is corticate, light beige to gray, with abundant black dots of pycnidia or nascent or abundant erumpent or sessile apothecia. The thallus is often partially or completely covered by soil particles or eroded. The cortex is up to 50 µm thick: the upper layer 5–7 µm thick, formed of the conglutinated and expanded apices of hyphae in a dark brown pigment zone, with a thin syncortex (sensu Knudsen 2008a) sealing the upper surface; the lower layer is 30–45 µm thick, hyaline, the hyphae irregularly oriented, 2–3(–4) µm in diam., septate, to subparaplectenchymatous, cells to 4 µm length. The algal layer is 10–50 µm thick, continuous, and uninterrupted, extending below the apothecia, but varying in height, algal cells mostly 7–10 µm in diam. The

medulla is grayish-white, to 100 µm tall, thoroughly mixed with soil particles, gelatinized, with branching anticlinal hyphae, hyaline, 3–4 µm in diam., thin-walled, cells 3–7 µm long or septa indistinct. The apothecia are abundant, round, 0.4–1.5 mm in diam. and sessile. The margin is black, smooth in young apothecia to knobby and crenulate in older apothecia, becoming flexuous. The disc is smooth to rugulose, epruinose, and black or red, often redder when wetted. The exciple is up to 100 µm thick of radiating hyphae mostly 2 µm in diam., septate, cells 3–5 µm long, hyaline, outer layer formed of melanized hyphal apices, dark brown to black. The hymenium is 85–130 µm high, conglutinated. The epihymenium is dark brown, 10 µm thick, paraphyses mostly 2 µm in diam., branching, and apices not expanded or barely expanded, septate, cells 5–10 µm long, with some oil drops. The asci are 60–80 × 20 µm, with about 100 ascospores per ascus. The ascospores are simple, hyaline, mostly 4–5 × 1.5–2.0 µm. The subhymenium is 20–30 µm thick, I+ blue turning red. The hypothecium is indistinct. The conidiomata are pycnidial, abundant, globose, ca. 100 µm in diam., wall thin, exposed ostiole area black. Conidiogenous cells 5–10 × 1.0–2.0 µm, conidia hyaline, 4–5(–5.5) × 0.5–1.0 µm. The species lacks secondary metabolites detectable by spot tests.

Sarcogyne crustacea is currently only known from two sites in southern California in western North America. It occurs on thin granite-derived coarse-grained and rocky soils over granite bedrock in the Santa Ana and San Jacinto Mountains in Riverside County from 940–1100 meters in chaparral areas. In the modern collections, *S. crustacea* is a component of biological soil crusts in terraces formed by *Selaginella bigelovii* Underw., a species endemic to southern California. Associated lichen species growing on soil or decaying granite include such rare Sonoran endemics such as *Acarospora thelococcoides* (Nyl.) Zahlbr., *Aspicilia glaucopsina* (Nyl. ex Hasse) Hue, and *Ramonia gyalectiformis* (Zahlbr.) Vězda as well as some more wide-spread species including *Acarospora obpallens* (Nyl. ex Hasse) Zahlbr., *Candelariella citrina* B. de Lesd., *Placidium lacinulatum* (Ach.) Breuss, *Psora californica* Timdal, *P. luridella* (Tuck.) Fink, and *Toninia aromatica* (Turner) A. Massal. The holotype of *S. crustacea* is a historical record from the San Gabriel Mountains at 1300 m in Los Angeles County; it was collected between stones and at the base of rocks on soil and is mixed with an unknown lichen and a moss.

Sarcogyne crustacea is extremely rare. Terricolous habitats in coastal southern California have been severely reduced by development, the remaining habitat often degraded by grazing, recreational use, invasive weeds, and fire (Knudsen & Magney 2006, Knudsen 2008b, Knudsen & Kocourková 2009). Consequently, biological soil crusts comprised predominately of lichens are now relatively rare although Hasse reported terricolous lichens as common at beginning of 20th century (Hasse 1913). Because of the reduction of biological

soil crusts, some species reported as common such as *Acarospora schleicheri* (Ach.) A. Massal. at beginning of 20th century (Hasse 1913) are now rare (Knudsen & Kocourková 2009). Some terricolous species possibly are already extinct like *Buellia bolacina* Tuck., a unique species known only from the holotype (Bungartz et al. 2008). Terricolous species, often rare, continue to be discovered and described from southern California, including recently several *Psora* (Timdal 2002) and *Cladonia* species (Ahti & Hammer 2002, Knudsen & Lendemer 2009), *Caloplaca obamae* K. Knudsen (Knudsen 2009), and a new *Rinodina* soon to be described by John Sheard.

Both the type of *Sarcogyne crustacea* and our best specimen from the Santa Ana Mountains are relatively poor. If better specimens are collected in the future, an epitype is needed as well as material for sequencing for phylogenetic analysis. We hope eventually to obtain good photographs of the species to present in one of our future floristic papers on the southern California lichen biota.

Specimen Examined. – **U.S.A. california: Riverside Co.,** Santa Ana Mountains, Elsinore Peak, south-facing slope on spike moss terraces above paved road, 33° 35' 48" N 117° 20' 21" W, 1101 m, 23.vi.2009, *K. Knudsen 11473 & R. Hernandez* (UCR); San Jacinto Mountains, spike-moss terraces on slope above San Jacinto River and Hwy 74, 33° 42' 39" N 116° 46' 36" W, 940 m, thallus eroded and covered with soil, 11.xi.2003, *K. Knudsen 689* (ASU, UCR).

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